A study of the subspecies of *Cethosia biblis* (Drury 1773) from the Philippines (Lepidoptera: Nymphalidae)

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Abstract: In this second paper covering representatives of the nymphalid species *Cethosia biblis* (Drury 1773) 4 of the currently described subspecies are dealt with: *Cethosia biblis insularis* Felder & Felder 1861, *Cethosia biblis placito* Tsukada 1985, *Cethosia biblis sandakana* Fruhstorfer 1899 and *Cethosia biblis liacura* Fruhstorfer 1912. A new subspecies, *Cethosia biblis* ***mapuna*** **ssp. n.,** is described and illustrated; holotype male in coll. Treadaway, designated to Senckenberg-Museum, Frankfurt am Main. The distribution of each subspecies on the Philippines as currently known as well as ♂♂ and ♀♀ of each subspecies and genitalia are figured.

Studien zu den Unterarten von *Cethosia biblis* (Drury 1773) in den Philippinen (Lepidoptera: Nymphalidae)

Zusammenfassung: In diesem zweiten Beitrag, der die gegenwärtig beschriebenen Taxa innerhalb der polytypischen Nymphalidenart *Cethosia biblis* (Drury 1773) zum Gegenstand hat, wird der Status von 4 philippinischen Subspecies untersucht: *Cethosia biblis insularis* Felder & Felder 1861, *Cethosia biblis placito* Tsukada 1985, *Cethosia biblis sandakana* Fruhstorfer 1899 und *Cethosia biblis liacura* Fruhstorfer 1912. Eine weitere Subspecies von den Philippinen, *Cethosia biblis* ***mapuna*** **ssp. n.,** wird beschrieben und abgebildet; Holotypus Männchen in coll. Treadaway, wird später ins Senckenberg-Museum, Frankfurt am Main, gelangen. Die Verbreitung für jedes der genannten Taxa auf den Philippinen wird nach dem jetzigen Kenntnisstand dargestellt, ebenso werden die Falter beider Geschlechter der einzelnen Unterarten sowie deren Genitalstrukturen abgebildet.

Introduction

The species *Cethosia biblis* (Drury 1773) has a wide distribution in the Oriental Region (Tsukada 1985, Küppers 2006a, Treadaway & Schroeder 2009). Previously, on the Philippines, *Cethosia biblis* was represented by the subspecies *insularis* Felder & Felder 1861 (= *eurymena* Felder & Felder 1867), *C. b. placito* Tsukada 1985, *C. b. sandakana* Fruhstorfer 1899 (= *barangingi* Tsukada 1985) and *C. b. liacura* Fruhstorfer 1912. A study of a very large number of *biblis* specimens from the areas occupied by the so far known subspecies over different periods of the year has illustrated that the variation on a number of islands for some of the known subspecies is very much broader than previously considered. As a consequence, *Cethosia biblis* on the Philippines is now believed to be represented by the 4 above mentioned subspecies plus a 5th: *Cethosia biblis mapuna* ssp. n. The revised distribution of each subspecies is shown on a map (Fig. 1) of the Philippines. The Mapun island (previously known as Cagayan Sulu) population is described and illustrated in this paper.

The ♂♂ of the Philippine subspecies are in appearance rather close to each other. However, the ♀♀ of *liacura, sandakana* and *mapuna* ssp. n. are noticeably different to the ♀♀ of *insularis* as well as those of *placito*. In specified island areas of the Philippines there are certain identifiable and reasonably constant differences. However, past authors used specific wing markings and patterns to differentiate subspecies that on examination of long series did not hold up. A basic feature which does hold up is:

a) the ♀♀ of *insularis* and *placito* always have a red base colour, and

b) the ♀♀ of *liacura, sandakana* and *mapuna* have a greenish base colour with some ♀♀ having a light brown base colour.

Abbreviations used

BMNH	The Natural History Museum, London (formerly British Museum (Natural History)).
CCGT	Collection Colin G. Treadaway, Limbach-Wagenschwend; will be incorporated into SMFL.
fw.	Forewing.
hw.	Hindwing.
lfw.	Length of forewing.
SMFL	Senckenberg-Museum, Frankfurt am Main, Lepidoptera collection.
uns.	Underside.
ups.	Upperside.

Taxonomic part

The following covers the key points for differentiating the accepted subspecies treated in this report based on good series at different times of the year for the areas involved.

Cethosia biblis insularis Felder & Felder 1861

(Figs. 2–9)

Distribution: Babuyanes, Luzon, Polillo, Marinduque, Lubang, Cuyo, Mindoro, Sibuyan, Masbate, Negros, Cebu, Camotes, Biliran and Mindanao except NE (Surigao and Agusan).

Lfw. ♂: 32–39 mm; ♀ 32–44 mm. For the ♂ ups. the base colour is red but can be when just emerged a bright pinkish red. Fw. ups. in the black apical area a double row of short white lines between the veins extending submarginally, but this can be only one row or for both rows only just visible. Inwardly from these white lines there are postdiscally a partial row of white helmet shapes between the veins which can vary between strongly

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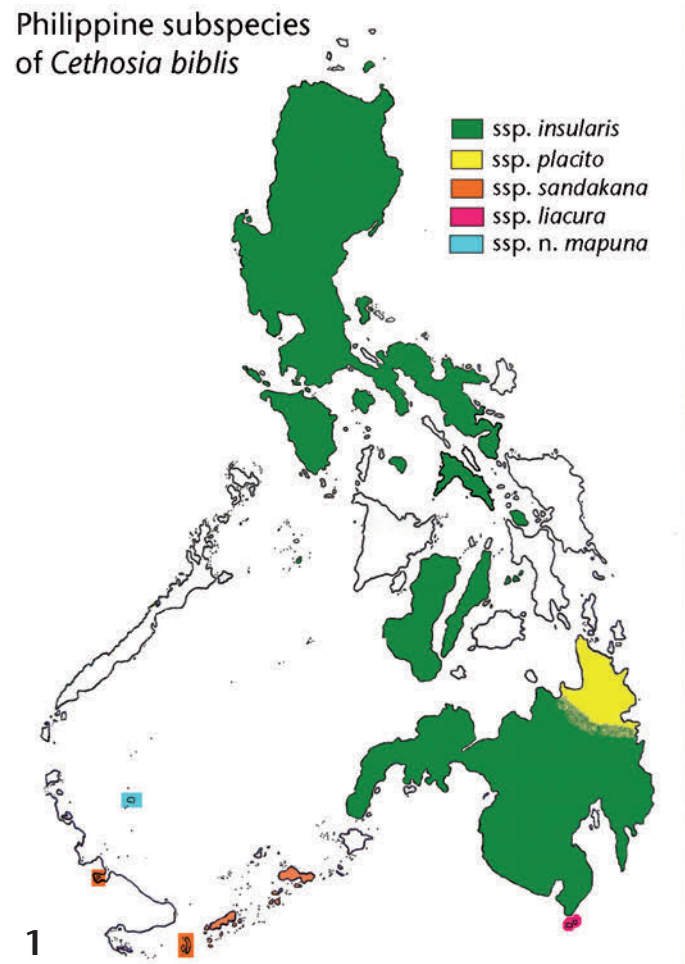

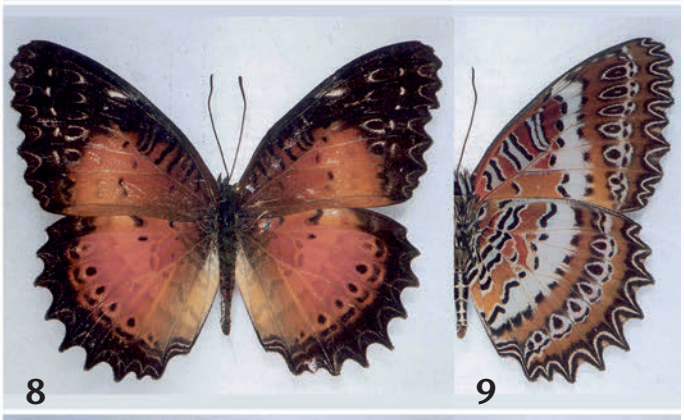

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Fig. 1: Map of the Philippine islands showing the distribution range of the *Cethosia biblis* subspecies found on the Philippines. White islands: no *C. biblis* ssp. recorded so far. — **Figs. 2–29:** Specimens of *Cethosia biblis* subspecies in the Philippines. — **Figs. 2–9:** *C. b. insularis*. **Fig. 2:** ♂, dorsal, C. Luzon, Angat Dam, 700 ft., 26. IV. 1988; lfw. 38 mm. **Fig. 3:** same specimen, ventral. **Fig. 4:** ♀, dorsal, NE. Luzon, Asacalat, 1700 ft., 14. V. 1990; lfw. 41 mm. **Fig. 5:** same specimen, ventral. **Fig. 6:** ♂, dorsal, S. Mindanao, S. Cotabato, Mt Parker, 31. VIII. 2003; lfw. 39 mm. **Fig. 7:** same specimen, ventral. **Fig. 8:** ♀, dorsal, same locality, 20. VIII. 2003; lfw. 36 mm. **Fig. 9:** same specimen, ventral. — **Figs. 10–13:** *C. b. placito*. **Fig. 10:** ♂, dorsal, NE. Mindanao, Agusan Norte, Cabadbaran, 600 ft., 3. VIII. 1980; lfw. 31 mm. **Fig. 11:** same specimen, ventral. **Fig. 12:** Paratype ♀, dorsal, same locality, 1. VIII. 1980; lfw. 41 mm. **Fig. 13:** same specimen, ventral. – **Figs. 14–19:** *C. b. sandakana*. **Fig. 14:** ♂, dorsal, Sulu Archipelago, Jolo Is., Pengulara Forest, 11. XI. 1987; lfw. 33 mm. **Fig. 15:** same specimen, ventral. **Fig. 16:** ♀, dorsal, same locality, 10. XI. 1987; lfw. 41 mm. **Fig. 17:** same specimen, ventral. **Fig. 18:** ♀, dorsal, Sulu Archipelago, Tawitawi Group, Bongao Is., The Peak, 10. III. 1990; lfw. 32 mm. **Fig. 19:** same specimen, ventral. – **Figs. 20–23:** *C. b. liacura*. **Fig. 20:** ♂, dorsal, Sarangani Is., off SE Mindanao, Davao Prov., 10. VII. 1989; lfw. 35 mm. **Fig. 21:** same specimen, ventral. **Fig. 22:** ♀, dorsal, SE. Mindanao, Davao Prov., considered from Sarangani Is., C. SEMPER leg. XII.; lfw. 37 mm (coll. G. SEMPER, SMFL). **Fig. 23:** ♀, dorsal, SE Mindanao, Davao Prov., considered from Sarangani Is. (coll. BMNH). — **Figs. 24–29:** *C. b. mapuna* ssp. n., Mapun Is. (former Cagayan Sulu Is.). **Fig. 24:** Holotype ♂, dorsal, 26. IV. 2004; lfw. 34 mm. **Fig. 25:** same specimen, ventral. **Fig. 26:** Paratype ♀, dorsal, 21. V. 2005; lfw. 36 mm. **Fig. 27:** same specimen, ventral. **Fig. 28:** Paratype ♀, dorsal, 19. V. 2005; lfw. 36 mm. **Fig. 29:** same specimen, ventral. – Photos C. G. TREADAWAY. Specimens not to the same scale, see lfw. data in legends.

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visible to very faint to non-existent. On the fw. costa at about $^{5}/_{8}$ from the fw. base there can be one or two white bars plus occasionally a white spot. The 2nd white bar is maximum 4 mm in length but can be reduced to 2 mm. The 1st white bar is often shorter than the 2nd. The 3rd costa white marking only occurs very occasionally and is never more than a white dot. For the hw. ups. there is always a black submarginal band of between 5–8 mm. Inwardly from this submarginal band there are usually a band of black lines between the veins followed further inwardly by a row of black spots between the veins. These markings are very variable. The black lines can be joined partially or totally to the submarginal black band. The row of black spots can be joined to the black lines for all or some of these lines or even merged together with the black lines directly into the black submarginal band making this band rather broad.

The above mentioned variations occur in the same location. The *insularis* ♂ uns. is reasonably constant across its distribution (Figs. 3, 7). Of note is the light creamy white discal band edged both sides with black spots or lines which on the fw. is not interrupted.

For the ♀ ups. the base colour is on the average a slightly duller red than for the ♂. Freshly emerged ♀♀ can possess a brighter somewhat pinkish red which fades quickly. The black markings of the fw. and hw. are as varied as for the ♂. There is a slight tendency for ♀♀ to have on the fw. ups. black postdiscal area somewhat more prominent white helmet shapes between the veins, but specimens occur almost lacking the row of helmet shaped markings. Of interest are the markings at the fw. costa, where the 2 white bars are usually about the same length (2–3 mm) but again, specimens occur with considerably reduced or even only one short bar. Just as for the ♂, ♀♀ also occasionally occur with a 3rd white spot as part of this ups. costa short band. Just as for the ♂, the above mentioned variations of the ♀ can occur on the same island, same location at the same time as the average marked ♀♀. The ♀ uns. is marked as for the ♂ but with some ♀♀ having the hw. postdiscal band of black spots being somewhat more prominent.

Cethosia biblis placito Tsukada 1985

(Figs. 10–13)

Distribution: Northeast Mindanao in the provinces of Agusan and Surigao.

Lfw. ♂: 31–37 mm; ♀ 38–41 mm. For both the ♂ and ♀ the base colour is red as for *Cethosia biblis insularis.* There are the usual variations of white markings for both sexes concerning the ups. black fw. subapical and postdiscal areas. The hw. black spots and lines inwardly from the black submarginal band are rather more heavily marked than for *insularis*. However, both sexes are readily separated from *insularis* by the white bars at the fw. costa ups. Subspecies *placito* has 4 obvious white bars as the start of a discal band. These bars measure from 2–6 mm in length with the 2nd bar being the longest and the 4th bar the shortest but always appearing as more than a dot. A further difference occurs on the uns. in which the discal white band on the fw. and hw. averages noticeably broader than for other Philippine subspecies (Figs. 11, 13) and appears to be more a bleached white.

Cethosia biblis sandakana Fruhstorfer 1899

(Figs. 14–19)

Distribution: Borneo: Northeast Sabah, Tun Sekaran Park islands (Lakim et al. 2003) and the Sulu Archipelago (Sibutu, Sanga Sanga, Bongao, Tawitawi, Siasi and Jolo).

Lfw. ♂: 34–37 mm; ♀ 38–42 mm. For the ♂ the base colour is red (Treadaway & Schroeder 2009). Of special interest in separating *Cethosia biblis sandakana* ♂♂ from *Cethosia biblis liacura* and *Cethosia biblis mapuna* ssp. n. ♂♂ is the uns. hw. postdiscal band of black spots and lines on a fine white background. The black spots are the smallest and the white band the narrowest of the latter 2 above mentioned subspecies. This point also applies to the ♀ hw. uns. postdiscal markings. Almost all of the *sandakana* ♂♂ and ♀♀ for the fw. ups. have the 2 white costa bars of equal length and have a further white spot discally below the white bars. Additionally, the light creamy white discal bands of the fw. and hw. uns. of ♂♂ and ♀♀ are almost as broad as for *Cethosia biblis placito*. The ♀♀ of subspecies *sandakana* have usually a green base colour but occasionally this base colour can be of a light brown (Figs. 18, 19).

Cethosia biblis liacura Fruhstorfer 1912

(Figs. 20–23)

Distribution: The Sarangani Island Group (Balut, Sarangani).

Lfw. ♂: 35–37 mm; ♀: 37–41 mm. Fruhstorfer's (1912: 501) original description of *Cethosia biblis liacura* reads: "... found in Mindanao, is distinguished from *insularis* from the northern Philippines by the more prominent white markings on the upper surface of the fw., in which it closely approaches *amboinensis*. In fresh ♂♂ the red basal area displays above a feeble but lovely blue iridescence never found in the paler light green or yellow brown ♀♀." We now know that *insularis* on the islands where it is distributed in the Philippines can range in the fw. upper surface between very prominent white markings to very lightly marked white markings. From our series from Sarangani the fw. upper surface white markings also vary from prominent to light. Thus the significant factor in Fruhstorfer's original description differentiating *liacura* from *insularis* is in the ♀ base colour which is light green or brown; *insularis* ♀♀ always have a base red colour. The iridescence mentioned by Fruhstorfer for freshly emerged specimens of *liacura* ♂♂ also occurs for *insularis* ♂♂.

The Sarangani Island Group is very close to southeast Mindanao (about 16 km) and is administered by Davao Province of Mindanao. Carl Semper collected extensively on Sarangani and specifically caught *Cethosia biblis* there (Semper 1888: 102) which he named *Cethosia eurymena*,

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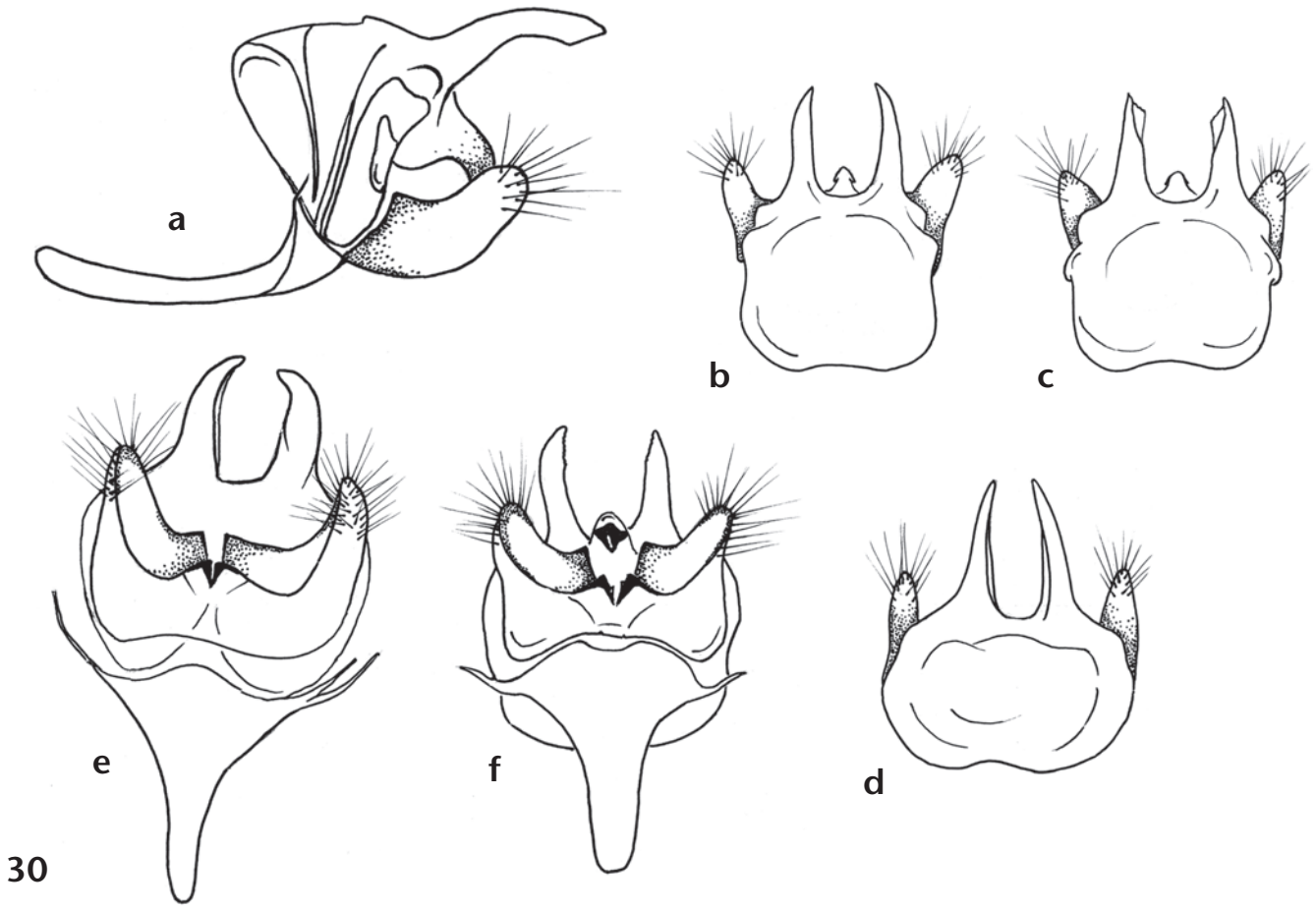

Fig. 30: ♂-genitalia of *Cethosia biblis* subspecies. — **Fig. 30a:** *C. b. sandakana*, left lateral aspect with phallus removed (GP 604 Schroeder), Sabah, Pulau Bohey Dulang. **Fig. 30b:** *C. b. sandakana*, tegumen, dorsal aspect with apices of valvae visible (GP 604 Schroeder), same locality. **Fig. 30c:** *C.b liacura*, tegumen, dorsal aspect (GP 606 Schroeder), Sarangani Is. **Fig. 30d:** *C.b. insularis*, tegumen, dorsal aspect (GP 605 Schroeder), S. Luzon. **Fig. 30e:** *C. b. insularis*, valvae and saccus, ventral aspect (GP 605 Schroeder), same locality. **Fig. 30f:** *C. b. mapuna* ssp. n., paratype, valvae and saccus, ventral aspect (GP 607 Schroeder), Mapun Is. — Drawings Inge Schroeder. Not to the same scale.

a name used at that time for all *Cethosia biblis* from the Philippines. It is our belief that the single green ♀ in the Senckenberg-Museum collected by Carl Semper and illustrated by his brother Georg (Semper 1888: pl. 18, fig. 2) as coming from Davao Province, southeast Mindanao, actually originated from Sarangani Island, Davao Province. Semper collected 384 specimens of *Cethosia biblis* in the Philippines but only a very few are now left in SMFL. We understand that some of the Semper material found its way to BMNH (a purchase by the BMNH on 29. viii. 1929 from the Senckenberg which included 6 *Cethosia biblis*). Additionally, other collectors obtained material listed from Davao, southeast Mindanao, about the same time or shortly after Semper collected on Sarangani (controlled by Davao, Mindanao). It is our belief that *C. biblis liacura* illustrated in current literature (Tsukada 1985: pl. 34, figs. 12–15; Küppers 2006b: pl. 32, figs. 3–6) from Mindanao are actually ssp. *insularis.* The ♀♀ illustrated by both authors have a red base colour — contrary to Fruhstorfer's (1912) original description of green or yellow brown. Tsukada's *liacura* specimens are from the border between the northeast provinces of Agusan and Bukidnon but he states (1985: 283) that *liacura* is from west Mindanano! Küppers (2006b: 1) gives the location of his *liacura* as west and south Mindanao. We have *biblis* ♂♂ and ♀♀ from north, south, southeast and west Mindanao which we believe to be *insularis*. Part of this material shows at the fw. ups. extensive white markings while the rest has much reduced white markings just as occurs in the north Philippines.

Cethosia biblis mapuna ssp. n.

(Figs. 24–29)

Holotype ♂: Philippines, Mapun Is., 26. iv. 2004.

Paratypes (in total 10 ♂♂, 4 ♀♀): all same location as holotype, 22. iv. 2001, 23. iv. 2003, 14., 15., 18., 29. v. 2003, 19., 22., 25. iv. 2004, 19., 21. v. 2005.

Deposition: holotype and paratypes in CCGT, to be transferred to SMFL.

Etymology: Named after the small isolated southwest Philippine island Mapun, previously known as Cagayan Sulu on which this new subspecies is found.

Distribution: Mapun Island (formerly known as Cagayan Sulu).

Diagnosis

Lfw. ♂ (n = 11): 31–39 mm; ♀ (n = 4): 37–40 mm.

♂. The base colour ups. for the fw. and hw. is red with the usual black subapical and submarginal bands marked

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particularly in the fw. with white bars, lines and dots as well as black postdiscal hw. bars and dots.

Comparing this new subspecies with *C. biblis liacura* and *C. biblis sandakana* the following differentiates them:

- *C. b. mapuna* ssp. n. The uns. white discal band for ♂♂ and ♀♀ is the narrowest of the 3 subspecies particularly for the fw. where there is often an interruption in this band. Additionally, the uns. hw. postdiscal band of black spots is quite prominent for both sexes.
- *C. b. sandakana*. The uns. white discal band for ♂♂ and ♀♀ is noticeably wide particularly for the ♀ hw. The postdiscal hw. uns. row of black spots is very small for all ♂♂ and ♀♀.
- *C. b. liacura*. The uns. fw. and hw. white discal band for ♂♂ and ♀♀ is similar to *sandakana*, but the hw. uns. postdiscal band of black spots is about the same as for ssp. *insularis.* For all 3 subspecies the ♀ base colour on the ups. is greenish but occasionally brown ♀♀ occur (Figs. 28, 29).

Conclusive remarks

The ♂ genitalia are rather similar for the Philippine subspecies of *Cethosia biblis* (Figs. 30a–f). This is also true of the subspecies distributed outside the Philippines (Tsukada 1985: 284, ♂-genitalia of *C. biblis* from Sumatra). The tegumen is stout and strongly sclerotized; with a pair of slightly curved processes projecting from the dorso-caudal edge of the tegumen. In *C. b. liacura* these processes are the shortest and strongest (Fig. 30c) compared to the longer and smaller processes typical of *C. b. insularis* (Fig. 30d). The gnathos is very compact and with its distal portion curved ventrad. Differences may also be recognized concerning the features of the saccus (Figs. 30e, f).

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